PATENT ABSTRACTS OF JAPAN

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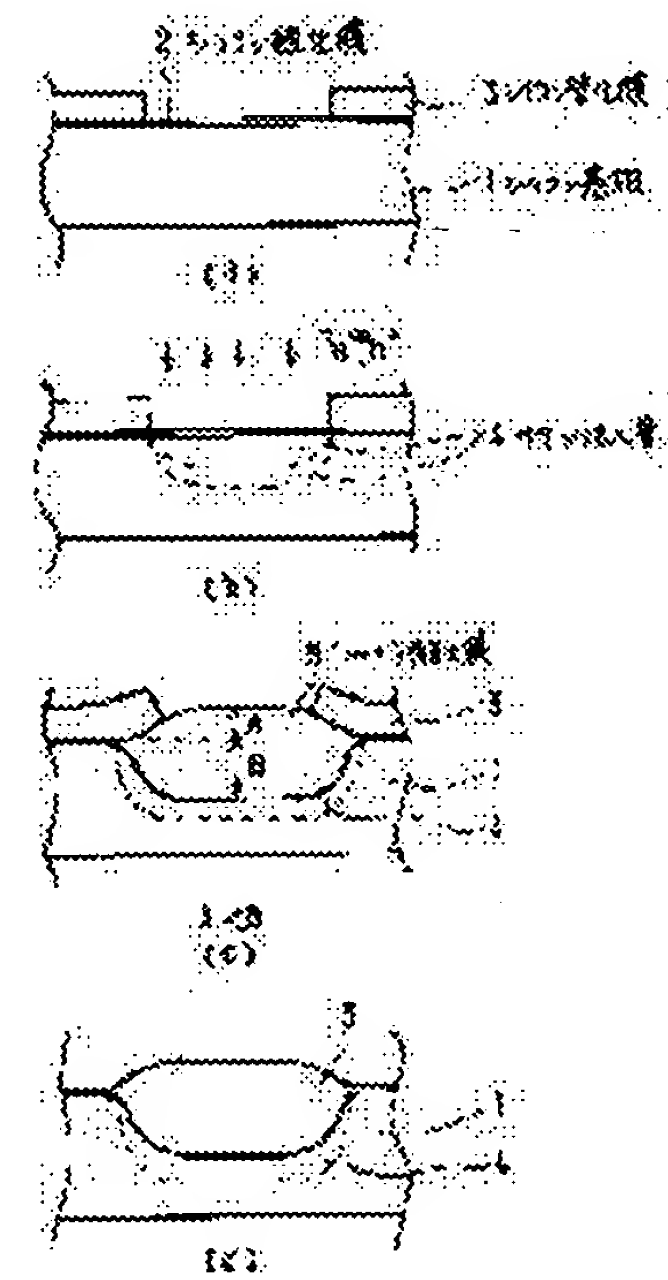
(54) MANUFACTURE OF SEMICONDUCTOR DEVICE

(57)Abstract:

PURPOSE: To make an element separating area finer and flatter than the conventional example by making crystalline silicon amorphous by implanting oxygen or silicon ions.

CONSTITUTION: After successively depositing a silicon oxide film 2 and silicon nitride film 3 on a silicon substrate 1, the film 3 is removed from an area proposed for forming an element separating area through a patterning and etching processes. Then a field oxide film 5 is formed by implanting oxygen or silicon ions after implanting boron ions for preventing the occurrence of field inversion and performing localized oxidation of silicon at 900-950°CC in a wet atmosphere. After forming the field oxide film 5, the silicon nitride film 3 is removed. Therefore, the field oxide film 5 can be subjected to fine working and flattened, since the film 5 is formed by heat treatment at a temperature lower than that of the conventional example.



LEGAL STATUS

[Date of request for examination]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to component separation technology.
[0002]
[Description of the Prior Art] The conventional component isolation region formation process drawing is shown in drawing 2 . In 1, a silicon nitride and 4 show the ion-implantation layer for field reversal prevention, and, as for a silicon substrate and 2, 5 shows field oxide, as for silicon oxide and 3.
[0003] Next, a production process is explained.
[0004] First, patterning and an etching process remove the silicon nitride 3 of the part used as a component isolation region after depositing silicon oxide 2 and the silicon nitride 3 on a silicon substrate 1 (drawing 2 (a)).
[0005] Next, by performing the ion implantation of the boron for field reversal prevention (drawing 2 (b)), and carrying out localized-oxidation-of-silicon oxidation at 1050-1100 degrees C in a wet ambient atmosphere, field oxide 5 of about 5000A of thickness is formed (drawing 2 (c)), and the silicon nitride 3 is removed after that (drawing 2 (d)).
[0006]
[Problem(s) to be Solved by the Invention] When using the above-mentioned process, in case localized-oxidation-of-silicon oxidation is performed, high heat treatment of extent is required. For this reason, since a BAZU beak occurred, and a different component isolation region from a desired configuration was formed by this and variation and a BAZU beak level difference arose in concentration distribution of the ion-implantation field 4 for field reversal prevention, detailed-izing and flattening of a component isolation region had been restricted.
[0007] This invention aims at offering the means which makes it possible conventionally detailed-ization and to carry out flattening for a component isolation region by performing low heat treatment of extent.
[0008]
[Means for Solving the Problem] After the manufacture approach of the semiconductor device of this invention forms silicon oxide and a silicon nitride on a semi-conductor substrate, patterning of it is carried out and it is characterized by having the process which performs the process which removes the above-mentioned silicon nitride of a component isolation region, and the ion implantation of the ion implantation for field reversal prevention, oxygen, or silicon, and the process which forms field oxide after this process.
[0009]
[Function] Using the process of the above-mentioned configuration, by performing the ion implantation of oxygen or silicon, by making crystal silicon amorphous, field oxide 5 can be formed and the direction of the thickness of lower part [thickness / of the field oxide 5 above silicon substrate 1 front face] field oxide 5 becomes thick by low heat treatment of extent rather than it oxidizes conventional crystal silicon.
[0010] Moreover, since oxygen ion works as a pro oxidant, the direction in the case of

carrying out the ion implantation of the oxygen can form field oxide 5 by heat treatment of lower extent compared with the case where silicon ion is poured in.
[0011]
[Example] Hereafter, this invention is explained to a detail based on one example.
[0012] Drawing 1 is production process drawing of one example of this invention. In 1, a silicon nitride and 4 show an ion-implantation layer, and, as for a silicon substrate and 2, 5 shows field oxide, as for silicon oxide and 3.
[0013] Next, a production process is explained. First, the silicon nitride 3 of the part which serves as a component isolation region according to patterning and an etching process is removed using a Prior art after depositing silicon oxide 2 and the silicon nitride 3 on a silicon substrate 1 (drawing 1 (a)).
[0014] Next, by performing the ion implantation of the boron for field reversal prevention, and acceleration energy 100-200KeV's performing the ion implantation of oxygen or silicon with the dose of 1016 ions/cm2 order after that, and carrying out localized-oxidation-of-silicon oxidation at 900-950 degrees C in a wet ambient atmosphere, field oxide 5 of about 5000A of thickness is formed (drawing 1 (c)), and the silicon nitride 3 is removed after that (drawing 1 (d)).
[0015] Before a localized-oxidation-of-silicon oxidation process, even if this invention is characterized by performing the ion implantation of oxygen or silicon and performs the ion implantation of oxygen or silicon before the ion-implantation process of the boron for field reversal prevention, it does the same effectiveness so and is not limited by the above-mentioned example.
[0016]
[Effect of the Invention] As mentioned above, since field oxide is formed by low heat treatment of extent from before by [which were explained to the detail] using this invention like, concentration distribution of a field reversal prevention layer becomes uniform, the shift by the BAZU beak etc. can be controlled, and since micro processing of field oxide becomes possible and the direction of the thickness of the field oxide below the thickness of the field oxide above a silicon substrate surface becomes thick again, flattening of field oxide becomes possible.

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CLAIMS

[Claim(s)]
[Claim 1] The manufacture approach of a semiconductor device which carries out patterning and is characterized by having the process which performs the process which removes the above-mentioned silicon nitride on a component isolation region, and the ion implantation of the ion implantation for field reversal prevention, oxygen, or silicon, and the process which forms field oxide after this process after forming silicon oxide and a silicon nitride on a semi-conductor substrate.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is production process drawing of one example of this invention.
[Drawing 2] It is production process drawing of conventional field oxide.
[Description of Notations]
1 Silicon Substrate
2 Silicon Oxide
3 Silicon Nitride
4 Ion-Implantation Field
5 Field Oxide

[Translation done.]

*. NOTICES *

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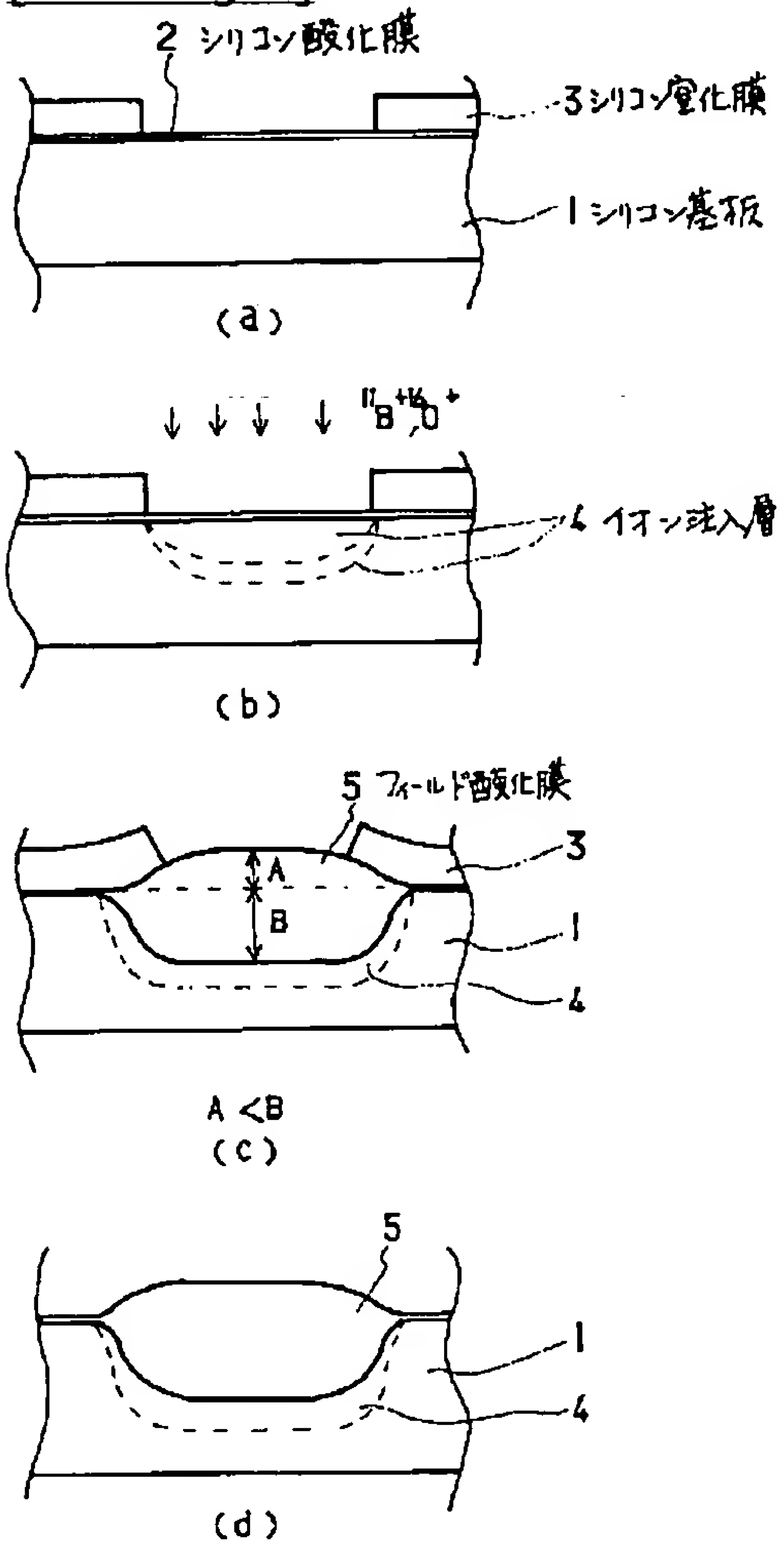
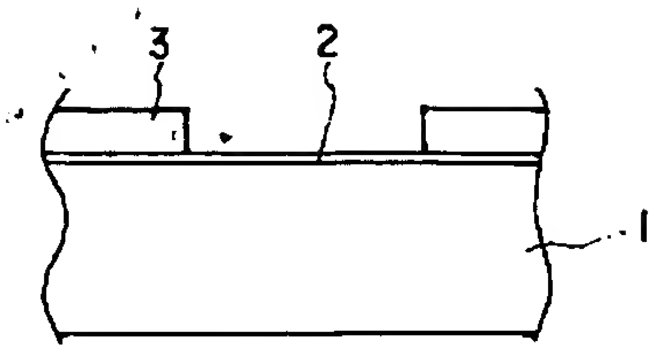
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

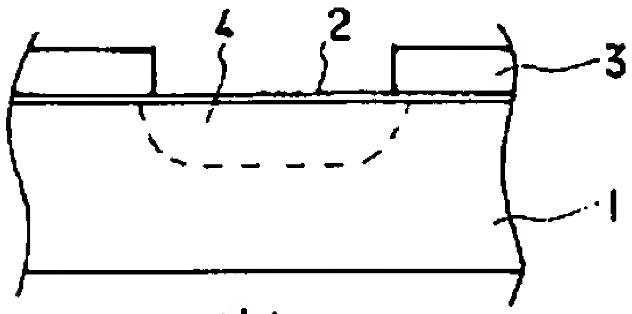
[Drawing 1]



[Drawing 2]



(a)



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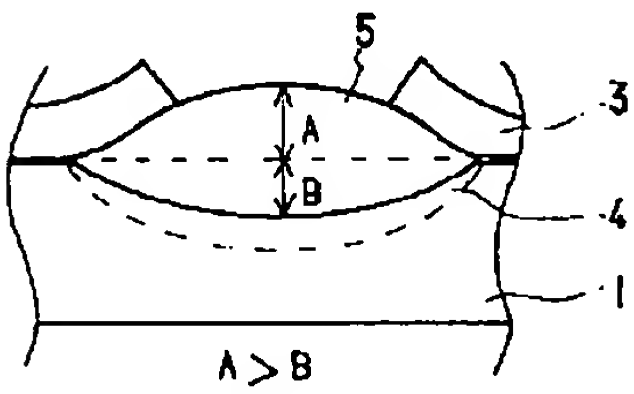
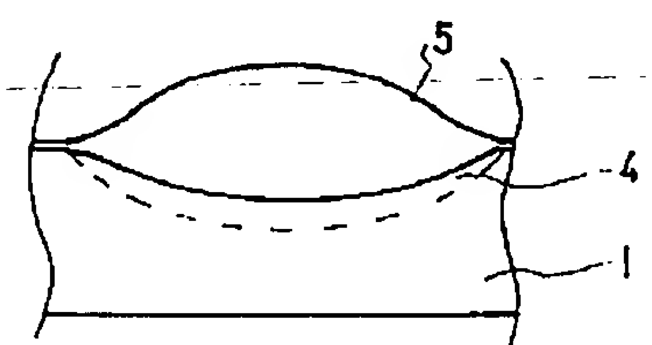


A > B

(c)



(d)

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